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## Wind-related disasters management and prevention improvement strategy

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### Abstract

The main purpose of the paper is to analyse the current situation and to provide suggestions for improving the Latvian system of wind disaster management by examining such sources as various scientific literature, different normative acts and specific practical examples. This paper briefly reviews the improvement possibilities to the Latvian system of wind disaster management by interaction between business, society and the state. The proposed hypothesis – timely, determined and coordinated interagency and interdepartmental cooperation – can minimize the effect and consequences of wind-related disasters. Several research methods, such as the analysis of academic and professional publications, and logical and comparative analysis, are applied in this research. The research results relate to the creation of disaster management policy methodology through increasing involvement of different stakeholders and development of deterrence measures. The main findings relate to the analysis of interaction of different public and private institutions for the management of wind induced disasters.

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### Introduction

Corporate Social Responsibility intervention with respect to the reduction of wind-related disaster risk is still one of possible initiatives for sustainable development paradigm, although the concept and practice of corporate sector involvement in social development is not new in Europe. Private sector and corporate contribution to wind-related disaster risk reduction and disaster management strategies remains insignificant. Currently, corporate social

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responsibility is based on policies and activities that do not directly address the disaster management system. Most private persons and entrepreneurs implement the corporate social responsibility projects through their own initiatives mostly addressing the issues of health and education. Therefore, there is a case for NGOs and civil society in general to get actively involved in natural disaster management and thus influence and encourage the increased involvement of corporate social responsibility. Several research methods, such as the analysis of academic and professional publications, and logical and comparative analysis, are applied in this research.

## **1. Climate change problems in Latvia**

Latvia also has encountered the climatic phenomena, unusual until now. In recent years, warm winters and strong gusts of wind often reaching the storm strength, are observed more and more frequently. Are such natural phenomena expected in the future? Studies carried out until now as Lawrence, Reisinger, Mullan, & Jackson (2013) and Rojas, Feyen, & Watkiss (2013) have shown that the average increase in air temperature is accompanied by changes in extreme air temperatures: increased number of days with high air temperatures and reduced number of days with low temperatures. In most areas, the number of frost days has decreased and in the Baltic Sea coastal areas the frost periods have become significantly shorter. The growing trend is demonstrated by extreme weather conditions associated with high temperatures during a many-year period. A significant increase is observed in the number of warm nights when the minimum air temperature is above +20°C and summer days hotter than +25°C. The increased heatwave duration is considered one of most dangerous phenomena. Positive growing trend is also demonstrated by indicators of extreme precipitation amounts, and this trend is most pronounced in cold time of year, especially in winter. Also in the city of Riga, the tendencies for changes are observed in both the air temperature and the extreme amounts of precipitation, which particularly relates to the increase in the number of summer days and tropical nights while the number of days with intense precipitation has also increased. It could be possibly associated with the increased intensity of urban heat island and specific urban climatic effect. (Latvian Environment, Geology and Meteorology Centre, 2015). As to the strong winds and storms, it should be mentioned that the Latvian observation station data did not show a clear trend for the increase in the wind speed. However, within the historical period since the 19th century, Latvian territory has been affected by more strong storms, which caused severe damages to forestry, power lines, agriculture and other objects. In coastal areas of the Gulf of Riga and the Baltic Sea, the increased storm frequency is predicted for the future as well. Future climate trends are anticipated basing on the forecasts of the global atmospheric circulation multimodal ensemble (see BACC Team, 2008, Meier et al., 2014). They concern mainly the prediction of average values of air temperature and atmospheric precipitation. Prediction of extreme events is very difficult, and scientists admit that it cannot be carried out accurately enough. Trends in climate changes anticipated for the future are similar to historical tendencies observed since the early 20th century. For Latvian territory, it means the average increase in the air temperature, which will become more rapid in winter and autumn seasons. However, the future increase in the frequency and intensity of storms could cause losses to the national economy, as well as adversely affect the marine coastal erosion processes and the flooding of wide coastal territories as a result of wind waves. In particular areas, global climate changes may cause not only negative but also positive effects. For example, in Latvian territory the increased air temperature during winter period means less energy consumption for heating of buildings. The increased length of the summer season and increased sea water temperature could affect the growth in tourism activities in coastal areas of the Baltic Sea and the Gulf of Riga during the summer season. Latvian territory's climatic conditions are largely influenced by global processes: the amount of solar energy and global atmospheric circulation processes; our future climatic conditions are largely dependent on global trends. Population, national economy facilities and other objects may be endangered by the storm with a wind speed of 25 m/s and more, which may cause breaks of electronic communication lines and electrical power lines, as well as damages to contacts and cables of urban electric transport and electric trains. Destruction or damage of dwelling houses and industrial buildings can take place, as well as vehicle accidents, devastation of forest, clogging of motor roads and streets (fallen trees, structures). Rainfall of 50 mm and more within 12 hours may cause rising water levels in rivers, flooding the lower places, house basements, etc. Strong snowfalls with snow cover growth 6-14 cm or more within 12 hours, snowstorm and icing may cause traffic disturbances, transport accidents, damages to power transmission and electronic communication lines, power supply

cuts, forest devastation. Flood threats in Riga and Jurmala may be caused by west wind lasting 2-3 days at a speed greater than 25 m/s, which afterwards turns into north-westerly wind and drives the seawater into the rivers Daugava and Lielupe, partially flooding the territories in the city of Riga.

Disaster management means the performance of preventive, preparative, responsive and mitigating emergency measures in case or at the threat of disaster. Disaster management is implemented by the state authorities, local governments, merchants and inhabitants. To improve the situation in administration of wind-related disaster management processes, first of all the society, responsible services and higher state officials should be informed about possible threats, their extent and consequences at all levels, from local, regional and to national, as well as an awareness should exist that we can be affected by wind-related disasters (Winter, 2014). The awareness of possible threats can induce many people to carry out their responsibilities since each person individually and then all together should wish to solve the existing problems and prepare for a situation when we might be affected by wind-related disasters. As also described by O'Brien, G., O'Keefe, P., Rose, J. and Wisner, B. (2006), Pearce (2003), Ahrens & Rudolph (2006) these activities must be carried out by responsible authorities, identifying the potential threats, informing the superior officials and, of course, the public, as well as carrying out measures to prevent disasters caused by wind.

## **2. Wind-related disaster management**

Much of the work has been done already in previous years, and many of the data have been preserved and used for decades. However, with changes in climatic conditions and performance of economic activity or also upon non-performance thereof, the previously made observations, estimates and forecasts may prove to be misleading. The identified potential disasters caused by wind are just the beginning, while overcoming their consequences needs to be prepared at all levels, starting with raising the public awareness, and finally with the responsible state officials. The greatest work should be carried out by responsible services depending on their functions, anticipating the possible accidents and their consequences, developing the possible scenarios and action plans, and improving the early warning systems with the use of more modern advanced techniques than the sirens. (Guha-Sapir, Hoyois Ph., & Below R., 2014) For example, in many advanced European countries, mobile phones are used for early warning of people since mobile communications cover a wider range of persons. May not forget a very important segment in liquidation of wind-related disaster consequences, that is the process of restoration of the damages and consequences. This process can be the hardest, longest and most expensive, because an accident usually occurs unexpectedly and often not in a long time; however, the recovery process can be very long, and looking back at the world's greatest disaster allows to observe their recovery processes not yet completed and the harm done to the environment and people still visible. The core problem of the restoration process is that much is non-renewable and is permanently lost, as well as finding the financing sources for liquidation of wind-related disaster consequences. Disasters cause huge material and financial damages to the environment, infrastructure and people, both directly and creating the costs of consequences liquidation. When eliminating the wind-related disaster consequences, the responsible institutions are spending their resources, which are intended for other activities. Carrying out the analysis of requirements established in Latvian statutory enactments for the management of both wind-damaged or simply flooded areas, it can be concluded that at the present time the Latvian regulatory enactments do not directly stipulate and set out the requirements for the identification of the flooded areas and their marking in the graphical part (maps) of the layout of local governments. Also on the national level, areas exposed to the flood risk (with various probability of possible recurrence) are not precisely identified and marked on the maps, as well as the proposals are not developed for anti-flood measures to be taken in these areas. Therefore, disagreements are possible between the planners and managers of the areas as to what areas shall be considered as flooded and/or exposed to flood risk and how these areas should be managed. Thus, the legal enactments practically contain no specific prohibitions or requirements aimed at preventing or reducing the possibility of flooding, its extent or damage caused. Some of these legal enactments (for example, the National Civil Defence Plan) regulate how to act in case of natural disasters. However, they are intended for situations where the disaster is approaching or has already taken place.

Corporate Social Responsibility intervention with respect to wind-related disaster risk reduction is still one of possible initiatives for sustainable development paradigm, although the concept and practice of corporate sector involvement in social development is not new in Europe. Private sector and corporate contribution to wind-related disaster risk reduction and disaster management strategies remains insignificant. Currently, corporate social responsibility is based on policies and activities that do not directly address the disaster management system. Most private persons and entrepreneurs implement the corporate social responsibility projects through their own initiatives mostly addressing the issues of health and education. Therefore, there is a case for NGOs and civil society in general to get actively involved in natural disaster management to thus influence and encourage the increased involvement of corporate social responsibility.

Assessing the consequences of disasters caused by wind, the authors came to the conclusion that there are the following most essential preventive measures to reduce the devastating effects of wind-related disasters:

- establishment of protection zones of different types and designed for different objects;
- performance of environmental monitoring and entering the obtained results into the Building Code;
- construction of hydrotechnical structures;
- personal responsibility of each individual and merchant.

Studying the current regulatory framework has shown that significant enough steps have been made for the mitigation of wind-related disasters, such as the specification of actions to be taken, responsibilities and restrictions in commercial activities of the state, local governments, merchants and each individual in order to mitigate the natural disasters. This regulatory framework provides for the establishment of protection zones, construction of hydrotechnical structures, durability of construction materials and structures under the climate impact. Pragmatic activities are carried out in those states, which upon commissioning of scientific studies have assessed the potential risks and basing on analysis of these risks have developed their own energy and transport infrastructure, as well as have based their economic development on this analysis. And also, to involve not only legal entities but also natural persons in the process of eliminating the negative effects of winds, the authors propose to more actively involve natural persons on a voluntary basis. One of incentives to participate in the wind aftermath liquidation could be a franchise insurance of both movable and immovable property for legal entities and natural persons. For example, local governments make lists of those having participated in the liquidation of the consequences described above, and after consultation with relevant responsible services these lists are sent to all insurance companies operating in the territory of Latvia, and then if a legal entity or a natural person that took part in these activities wishes to acquire or renew an insurance policy, then relevant insurance company will be able to offer such legal entity or natural person a substantial discount on the insurance premium.

Traditionally, the responsibility of an individual is more likely associated with particular aspects of climate changes. Thus, it was proven (Kuo, L., Yeh, C.-C. and Yu, H.-C., 2012) that only particular state-owned enterprises and environmentally sensitive companies approach the specific ecological component aspects of CSR. In contrast with traditional theories, the authors agree with Shrivastava (1995) that in the field of corporate social responsibility a transit should be made from the anthropocentric approach to the ecocentric concept, keeping up also the corporate responsibility for the prevention and elimination of disaster consequences. In this case the authors understand it as a permanent interaction of all responsible institutions and natural persons in the field of preventive measures and events as well as in the liquidation of adverse wind effects. Indeed, this model is unstable and therefore at the national level the sustainable development and crisis prevention and management will be needed by decision-making on legislative level.

## Conclusions

When analyzing the scientific literature, various regulatory enactments and specific practical examples regarding wind-related natural disasters in Latvia, the authors came to the following conclusions:

Wind- caused disasters have most devastating consequences. Such disaster can simultaneously cover a large area and affect almost all sectors of national economy, causing large, sometimes even irreparable damages. The biggest costs in elimination of wind-related disaster consequences are associated with restoration of infrastructure, prevention of forest devastation, liquidation of damages in ports, buildings and structures, and restoration of power

lines operation. Wind-related disaster management is a very expensive process, Therefore, the lack of financial resources can significantly influence the complex of preventive and mitigating measures to be taken. Inter-institutional and inter-sectoral collaboration demonstrates wide opportunities for growth in management of disasters caused by wind (and not only). For example, granting of considerable discounts on insurance of both movable and immovable property for legal entities and natural persons having taken part in elimination of wind consequences. Personal understanding and daily business of each society member can significantly mitigate the wind-related disasters. Establishment of protection zones is a significant contribution to mitigation of wind-related disasters, but current model of protection zone formation is not comprehensive, neglecting the operational maintenance of hydraulic structures and construction of new protective hydrotechnical facilities, land protection against wind-related flood. Carrying out the analysis of requirements established in Latvian statutory enactments for the management of both wind-damaged or simply flooded areas, it can be concluded that at the present time the Latvian regulatory enactments do not directly stipulate and set out the requirements for the identification of the flooded areas and their marking in the graphical part (maps) of the layout of local governments. Everyday professional activity of the authors suggests to conclude that institutions involved in mitigation of wind-related disasters do not work as a big single coordinated force. Each institution works according to its own algorithm, and it appears that not all employees of involved institutions are aware of operational principles and algorithms specified in the Civil Defence Plan.

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